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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/549,267	09/13/2005	Volker Rasche	PHNL030288US	1659

38107 7590 06/26/2007

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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EXAMINER	
COCHRAN, ANTHONY K	
ART UNIT	PAPER NUMBER
2882	
MAIL DATE	DELIVERY MODE
06/26/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/549,267	RASCHE ET AL.	
	Examiner	Art Unit	
	Anthony Cochran	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 September 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

In response to the Office action dated 11/30/2006, the applicant's Amendment has been received on 02/23/2007.

Claim Objections

Claims 1, 5, 7, and 10 –17 are objected to because of the following informalities:

The claim(s) are narrative in form and replete with indefinite and functional or operational language. The steps which go to make up the method must be clearly and positively specified. The steps must be organized and correlated in such a manner as to present a complete operative method. A few examples of narrative language follow:

In claim 1, line 4, "viz a viz" is awkward and narrative.

In claim 5, line 1, "and being" is awkward and narrative.

In claim 7, line 1, "through" is awkward and narrative. The examiner suggests changing the language to -- further comprising --.

In claim 10, line 1, "for use with " is awkward and narrative.

In claim 11-14 and 16, line 1, "whilst" is awkward and narrative. The examiner suggests changing the language to -- further comprising --.

In claim 15, line 1, "and applied to" is awkward and narrative. The examiner suggests changing the language to -- further comprising --.

In claim 17, line 1, "and including" is awkward and narrative. The examiner suggests changing the language to -- further comprising --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 4, 6, 8 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 4, line 2, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

In claim 6, line 2, the limitation "their calculated shape" lacks proper antecedent basis.

In claim 8, line 1, the limitation "in particular" is indefinite insofar as the limitation sets forth an example.

In claim 13, line 4, the limitation " the two methods" lacks proper antecedent basis. The Examiner has examined the claims as best understood as follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 6, 10, 15, 17, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Rodet et al. (US 20020131650 A1).

With respect to claims 1, 6, and 18, Rodet et al. discloses an X-ray imaging method and apparatus (fig. 1) for carrying out said method comprising: forming a set of a plurality of two-dimensional (2D) X-Ray projection images Rf (para 0015, line 12) of an object (1) to be examined through a scanning rotation (para 0015, lines 2-3) by an X-Ray source (4), which 2D projection images are acquired at respective predetermined time instants t (para 0017, lines 1-5), correcting each 2D projection Rf individually to compensate for global movement prior to back projecting (para 0033), and reconstructing a three-dimensional volume image (paras 0015 and 0004) by back-projecting (para 0024 and step P4 of fig. 3) the 2D projections.

With respect to claim 10, this claim is directed to the object that is to be imaged by the claimed method. Consequently, it fails to distinguish the claimed method over the prior art.

With respect to claims 15, Rodet et al. discloses generating a four-dimensional data set (4D matrix, para 0035).

With respect to claims 17, Rodet et al. discloses a transformation matrix of projections (para 0034).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3, and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rasche et al. (US 20020126794 A1) in view of. Rodet et al. (US 20020131650 A1).

With respect to claim 1, Rasche et al. discloses an X-ray imaging method comprising steps of: forming a set of a plurality of two-dimensional X-Ray projection images (fig. 1 and para 0012) of an object (3) to be examined through a scanning rotation (para 0013) by an X-Ray source (12), which 2D projection images are acquired

at respective predetermined time instants (fig. 2 and para 0011) and reconstructing a three-dimensional volume image (para 0012).

Rasche et al. fails to disclose correcting each 2D projection individually to compensate for global movement prior to back projecting.

Rodet et al discloses correcting each 2D projection Rf individually (para 0033) prior to back projecting (para 0006).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Rasche et al. to include correcting individual projections prior to back projection as suggested by Rodet et al., since a person would have been motivated to compensate for global movement and to provide transformed projections with a much more reduced frequency domain as stated by Rodet et al. (para 0033).

With respect to claim 2, 3, and 13, in the invention of Rasche et al. as modified by Rodet et al., motion correction ~~will~~ would be derived from reference images (Rasche et al., para 0013, D_i), that are acquired in corresponding instants of cardiac movement (Rasche et al., para 0014, line 2) of the object in question that is substantially periodic based on ECG analysis (Rasche et al., para 0014, line 3), these reference images would have substantially differing projection orientations (Rasche et al., see fig. 1).

With respect to claim 14, Rasche et al. discloses using cardiac motion compensation for three-dimensional cardiac ROI reconstruction, and generating and overlaying multiple runs of a cardiac region whilst maintaining one or more markers at

the same position, and by overlaying making the multiple cardiac ROI reconstructions (para 0002 and para 0005).

Claim 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rasche et al. (US 20020126794 A1) and Rodet et al. as applied to claim 3 above, and further in view of Rasche et al. (WO 2103639 A2).

With respect to claim 4, Rasche et al. (US 20020126794 A1) and Rodet et al. disclose the method as claimed in claim 3.

Rasche et al. (US 20020126794 A1) and Rodet et al. fail to disclose that movement is derived from following one or more feature points of the object, such as bifurcation points.

Rasche et al. (WO 2103639 A2) further discloses that movement is derived from following one or more feature points of the object, such as bifurcation points (page 3 lines 19-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the system of Rasche et al. (US 20020126794 A1) and Rodet et al. to include following one or more feature points of the object as suggested by Rasche et al. (WO 2103639 A2), since a person would have been motivated to use feature points within the object to create an accurate motion model as stated by Rasche et al. (WO 2103639 A2) (col 3, line 16-22).

With respect to claim 5, Rasche et al. (US 20020126794 A1) and Rodet et al. disclose the method as claimed in claim 1.

Rasche et al. (US 20020126794 A1) and Rodet et al. fail to disclose the method being based on feature extraction for deriving the motion vector field.

Rasche et al. (WO 2103639 A2) further discloses using feature extraction for deriving a motion vector field (paragraph bridging pages 5-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the system of Rasche et al. (US 20020126794 A1) and Rodet et al. to include using feature extraction for deriving said motion vector field as suggested by Rasche et al. (WO 2103639 A2), since a person would have been motivated to reduce motion artifacts from reconstructed images.

Claims 7-9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rasche et al. (US 20020126794 A1) and Rodet et al. as applied to claim 1 above, and further in view of Heuscher et al. (US 2003/0007593 A1).

With respect to claims 7 and 8, Rasche et al. (US 20020126794 A1) and Rodet et al. disclose the method as recited in claim 1.

Rasche et al. (US 20020126794 A1) and Rodet et al. fail to disclose separating an estimated motion of parts of said object into a non-linear temporal component, and a linear temporal component as applied to coronary arteries.

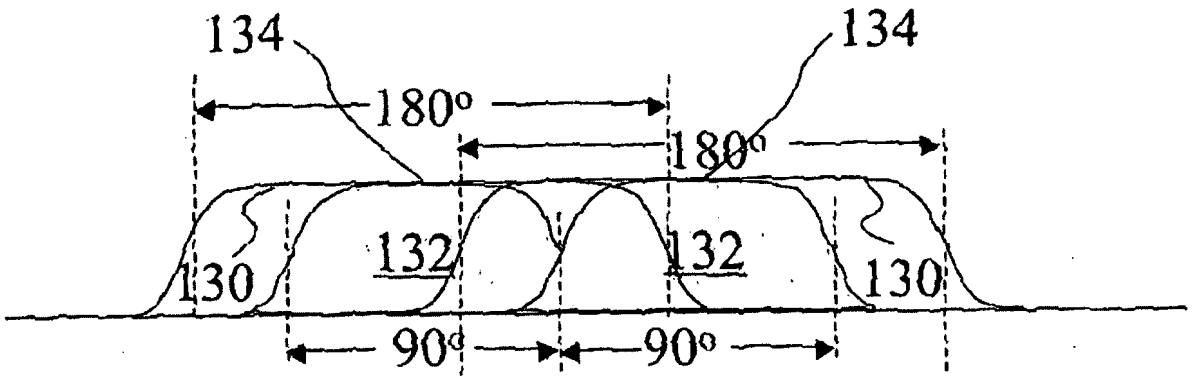
Heuscher et al. further discloses a method separating an estimated motion of parts of said object into a non-linear temporal component and a linear temporal component (para 0058), as applied to coronary arteries (concept applicable to major arteries, para 0073).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the method of Rasche et al. (US 20020126794 A1) and Rodet et al. to include separating the linear and non-linear components as suggested by Heuscher et al., since a person would have been motivated to improve temporal and spatial resolution in moving anatomy as stated by Heuscher et al. (para 0020).

With respect to claim 9, Rasche et al. (US 20020126794 A1) and Rodet et al. discloses the X-ray CT imaging method as recited in claim 1 above.

Rasche et al. (US 20020126794 A1) and Rodet et al. fail to disclose wherein said projection orientations differ by an angle in a range between substantially 45 degrees and 90 degrees.

Heuscher et al. discloses wherein said projection orientations differ by an angle in a range between substantially 45 degrees and 90 degrees (in FIG. 6C and [0081]).



(Figure 6c, reproduced from **US 2003/0007593 A1**)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the method of Rasche et al. (US 20020126794 A1) and Rodet et al. to include the projection orientations that differ by an angle in a range between substantially 45 degrees and 90 degrees as suggested by Heuscher et al., since a person would have been motivated to have a method which identifies a plurality of data acquisition windows in each cardiac cycle as stated by Heuscher et al. (para 0021) .

With respect to claim 16, Rasche et al. (US 20020126794 A1) and Rodet et al disclose the method as recited in claim 1.

Rasche et al. (US 20020126794 A1) and Rodet et al. fail to disclose determining a temporal gating based on 3D resolving of a feature point.

Heuscher et al. discloses determining a temporal cardiac gating based on volumetric imaging (paras 0060 and 0071).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Rasche et al. and Rodet et al. to further include determining a temporal gating as suggested by Heuscher et al., since a person would have been motivated to improve temporal and spatial resolution in moving anatomy while being able to view the feature in 3D.

6/22/07

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rasche et al. (US 20020126794 A1) and Rodet et al. as applied to claim 1 above, and further in view of Carroll et al. (US 6501848 B1).

With respect to claim 11, Rasche et al. (US 20020126794 A1) and Rodet et al. disclose the X-ray CT imaging method as recited in claim 1 above.

Rasche et al. (US 20020126794 A1) and Rodet et al. fail to disclose a method deriving said motion correction from physical elements present in the object, such as markers provided on a stent delivery catheter or on a guidewire.

Carrol et al. discloses using catheterization (col 7, line 14) and stents (col 7, line 42) in a 3D image correction protocol.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Rasche et al. (US 20020126794 A1) and Rodet et al. to include using catheterization as suggested by Carrol et al., since a person would have been motivated to quantify vessel geometry and the effects of drugs on the regression and progression of coronary artery disease as stated by Carrol et al. (col 2, line 49-50).

With respect to claim 12, Rasche et al. (US 20020126794 A1) and Rodet et al. disclose the method as recited in claim 1 above.

Rasche et al. (US 20020126794 A1) and Rodet et al. fail to disclose a correction using an overall translation pertaining to an object.

Carroll et al. further discloses a method including correction using determined translation from bifurcation points (col 4, lines 25-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the method of Rasche et al. (US 20020126794 A1) and Rodet et al. to further include in the correction an overall translation as

suggested by Carroll et al., since a person would have been motivated to improve reconstruction of 3-D images from 2-D image data as stated by Carroll et al. (col 3, lines 5-10).

Response to Arguments

In response to Applicant's request for further explanation of the inadequacy in light of 37 CFR 1.98(b), Applicant's reference to documents EP 02 292 995.4, EP 03 290 455.9, and EP 02 292 336.1 on page 3, line 28 of the specification does satisfy the list requirement under 37 CFR 1.98(b). Therefore, unless these references have been cited by the examiner on form PTO-892, they have not been considered. If the Applicant would like these references considered, a proper information disclosure statement in compliance with 37 CFR 1.97 and 1.98 must be submitted.

The objections to the specification and claims, and the rejections under 35 U.S.C. § 112, second paragraph, in the Office Action mailed 11/30/2006 have been withdrawn in light of the Amendment filed 02/23/2007.

Applicant's arguments, see page 12, lines 1-4, filed 02/23/2007, with respect to the rejection of claims 1-6, 10, 13-14, 17, and 18 under 35 U.S.C. 102(b) and claims 7-9, 11-12, and 15-16 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Rodet et al. (US 20020131650 A1) since it teaches a method which includes correcting each of a set of 2D projections individually, prior to generating a 3D image via back projection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Cochran whose telephone number is (571) 272-9794. The examiner can normally be reached on Monday - Friday from 8:00am to 5:00pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick, can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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